

REMARKS

This paper responds to the Office Action mailed on February 14, 2005.

Claims 7, 8, 13, 20, 34 and 40 are amended, no claims are canceled, and no claims are added; as a result, claims 3, 5, 7-42 and 65 are now pending in this application.

Information Disclosure Statement

Applicant submitted a Supplemental Information Disclosure Statement and a 1449 Form on September 9, 2004. Applicant respectfully requests that an initialed copy of the 1449 form be returned to Applicants' Representatives to indicate that the cited references have been considered by the Examiner. Copies of this filing are enclosed for the examiner's convenience.

The outstanding Office Action at section 7 on page 6 states that “applicant argued that Matsuda does not teach the use of a discontinuous seed layer for electroless plating a metal (Cu)”, and suggests that Matsuda does use a discontinuous plating layer. Applicant submits that in the disclosed method of Matsuda “a copper film 57 is formed as the third metal film by electroplating or electroless plating” (col. 7, lines 8-9), which one of ordinary skill in the art would understand means a continuous plating film. This is true because the Matsuda reference teaches that the disclosed arrangement may be used for either electrode or electroless plating, and electroplating requires a continuous conductive film to spread the electrical current to all portions of the wafer. Thus Applicant respectfully submits that the suggested combination of Tan and Matsuda would not result in the claimed arrangement of a discontinuous seed layer, because the Tan reference states that “the layer 14 may also include a sputtered layer of copper overlying the titanium tungsten and or titanium tungsten nitride layers to provide a seed layer for electroplating” (col. 3, lines 43-46), and thus both references necessarily teach continuous layers under the plating. Since both references teach continuous plating layers, sometimes plating layers that are formed by multiple layers of materials, then even if there was a motivation to make the combination, the result still does not contain each and every feature of the claimed invention. To make the above discussed difference between the cited references and the claimed invention, Applicant has herein amended the independent claim 8 to state that “...individual

elements of the discontinuous seed layer are substantially electrically isolated from each other ...”, which feature is not described or suggested by the cited references of Matsuda or Tan, whether taken alone or in any combination. The remaining independent claims recite, in part, individual elements of the first discontinuous seed layer are substantially electrically isolated from each other . . .”, which feature is not described or suggested by the cited references of Matsuda or Tan, whether taken alone or in any combination. Tan shows the continuous conductive titanium layer 14, and Matsuda shows continuous tantalum nitride layer 12, or conductive layer 32, or titanium layer 55, or barrier metal layer 114 and copper layer 115. Both references show continuous metal layers in all embodiments, and Applicant submits that discontinuous layers would result in the references being inoperative, since the described continuous layers are used as diffusion barriers. Applicant submits that the present amendments to the independent claims, while not necessary to distinguish over the cited references, do make the differences in structure more clear over the cited references, and request that the claims be passed to issue.

§103 Rejection of the Claims

Claims 8-10 and 34-37 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Tan et al. (U.S. Patent 6,372,622) in view of Matsuda et al. (U.S. Patent 6,403,481). Applicant respectfully traverses this rejection.

As previously discussed above and in the prior response, incorporated herein by reference, the Tan reference teaches a barrier layer used as a seed layer which is continuous and must be continuous for Tan to function. The Matsuda reference teaches a barrier layer (12 of 32) with nucleation sites (13 and 34 respectively) to form very large grain size metals to “provide good electromigration resistance” (See col. 2, line 15).

The Examiner has the burden of establishing a prima facie case of obviousness under 35 USC § 103(a), and the test is whether one of ordinary skill in the art, with the suggested references in front of him, would be motivated to make the proposed combination. Applicant respectfully submits that one of ordinary skill in the art would understand that the barrier layer 14, described in Tan as being of titanium-tungsten or of titanium-tungsten nitride, is not a discontinuous seed layer, because it is a diffusion barrier as noted in the previous response.

Thus the Office Action fails to show motivation to combine the cited documents to obtain the claimed arrangement of “...*depositing a discontinuous seed layer including a thin film of Palladium (Pd) or Copper (Cu) having a discontinuous island structure on a semiconductor substrate using a sputtering deposition technique, wherein individual elements of the discontinuous islands are substantially electrically isolated from each other ...*”, as recited in independent claim 8, as amended herein, since to do so would result in the failure of the cited reference to function. A diffusion barrier can not function if it is too thin or discontinuous. For similar reasons claim 34 is patentably distinct over the suggested combination of references, and the dependent claims are patentable at least as depending from base patentable claims.

In view of the above discussion and amendments, Applicant respectfully requests that this rejection be reconsidered and withdrawn.

Claims 3, 5, 7, 12, 38-42, and 65 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Tan in view of Matsuda and Naik et al. (U.S. Patent 6,245,662). Applicant respectfully traverses this rejection.

Tan and Matsuda have features discussed above and in the previous response. Naik is used to show that oxygen plasma ashing of photoresist is known. Applicant notes that claim 7 recites “...*removing the photoresist layer and exposed portions of the seed layer using oxygen plasma ashing ...*”, which feature is neither described nor suggested in any of the suggested combination of references. The Naik reference at column 6 suggests that allowing the copper to be exposed to resist strip may result in corrosion and a residue problem, contrary to the Examiner’s suggestion in section 4 of the outstanding Office Action. Applicant submits that the Naik reference teaches away from the claimed invention, and that even if the Naik reference was proper, the result would still neither describe or suggest “...*depositing a discontinuous seed layer including a thin film of Palladium (Pd) or Copper (Cu) having a thickness of less than 15 nanometers (nm) on a semiconductor substrate, wherein individual elements of the discontinuous seed layer are substantially electrically isolated from each other ...*”, as recited in independent claim 7, as amended herein. The cited references do not suggest a discontinuous seed layer, and clearly show that the plating is on a necessarily continuous conductive layer since both teach an

arrangement that can use electrode plating and uses at least part of the plating layer for diffusion barrier purposes.

The dependent claims are seen as patentable at least as depending from patentable base claims. In view of the above discussion and amendments, Applicant respectfully requests that this rejection be reconsidered and withdrawn.

Claims 5, 11, and 13-33 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Tan in view of Matsuda or Tan in view of Matsuda and Naik and Andricacos et al. (U.S. Patent 5,937,320). Applicant respectfully traverses this rejection.

Tan, Matsuda and Naik have features discussed above and in the previous response. Andricacos is used to show that plating to the top of the photoresist layer is known. The Andricacos reference is not seen as correcting the above noted failures of the other references to teach “...*depositing a first discontinuous seed layer including a thin film of Palladium (Pd) or Copper (Cu) on a semiconductor substrate, wherein individual elements of the first discontinuous seed layer are substantially electrically isolated from each other ...*”, as recited in claims 13 and 20, as amended herein. The argument is similar to that given above and in the previous response.

The dependent claims are seen as patentable at least as depending from patentable base claims. In view of the above discussion and amendments, Applicant respectfully requests that this rejection be reconsidered and withdrawn.

Claims 13-42 were rejected under 35 U.S.C. § 103(a) as being unpatentable over the combination of Tan, Matsuda and/or Naik and/or Andricacos in view of Simpson (U.S. Patent 6,197,688). Applicant respectfully traverses this rejection.

Tan, Matsuda, Naik and Andricacos have features discussed above and in the previous response. Simpson is used to show that repeating a series of steps is known. The Simpson reference is not seen as correcting the above noted failures of the other references to teach “...*the individual elements ... are substantially electrically isolated from each other ...*”, as recited in the independent claims, as amended herein. The argument is similar to that given above and in the previous response.

The dependent claims are seen as patentable at least as depending from patentable base claims. In view of the above discussion and amendments, Applicant respectfully requests that this rejection be reconsidered and withdrawn.

CONCLUSION

Applicant respectfully submits that the claims are in condition for allowance and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney (612) 349-9587 to facilitate prosecution of this application.

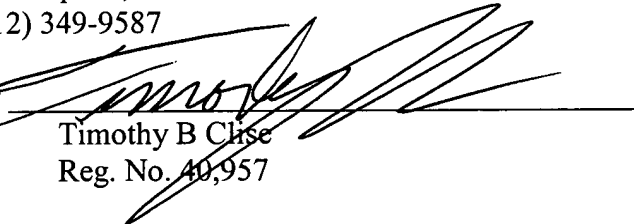
If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,
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11 May '05

By


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CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to: Mail Stop AF, Commissioner of Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on this 12 day of May, 2005.

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